

## Finding the Pedigree of Ringtailed Lemur (*Lemur catta*) and Inca Tern (*Larosterna inca*) Using Molecular Methods

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### Background

As an Argonne intern, Nadia Ahmed applied DNA-based molecular biology techniques to find aptamers from a library of DNA sequences. Aptamers are the DNA-based version of antibodies and thus can be utilized in similar pharmaceutical applications. Although her project at Brookfield Zoo's Genetics lab is quite different from screening for aptamers, many of the DNA-related techniques that she learned from her Argonne mentor, Dr. Michelle Benig Arora are still used.

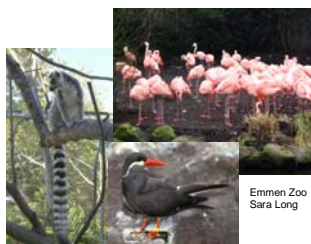
In her research at Brookfield Zoo, two species that have different breeding structures, were selected for study aimed at maintaining genetic diversity and avoiding inbreeding. Pedigree reconstruction offers a means to possibly increase genetic diversity, ensuring captive populations remain strong by helping to return individuals to the breeding population. This is vitally important for species that are endangered or threatened and declining in the wild. The two species selected are, *Lemur catta*, Ringtailed lemur and *Larosterna inca*, Inca tern. Analysis will be done with these two species to provide as much information as possible for their respective management plans and to explore the use of molecular methods such as Polymerase Chain Reaction and DNA Fingerprint to find the pedigrees.

### Introduction

There are 357 species managed with breeding plans: 125 Species Survival Plan species (SSP) and 232 Population Management Plan species (PMP).

More than 90% of the studbooks list individuals with unknown pedigree. For some species, 90% of the population are of unknown pedigree. They are non-breeding, possibly genetically valuable members, taking up valuable space.

**Goals:** have all founders equally represented, maintain genetic diversity, and avoid inbreeding



### Group Living Species

Two species were selected for further study, based on several criteria:

- They are currently in Brookfield Zoo's collection
- They are group-living--large social groups or colonial nesters
- They are or will become an SSP species
- A significant portion of the population has an unknown pedigree and has not been allowed to breed

### Inca Terns (*Larosterna inca*)

There are 250 terns held in 23 institutions. Forty percent of the population cannot breed due to unknown pedigree (109 birds). This affects 18 institutions.

How do you keep a group-living bird from breeding? Are there extra-pair copulations?



### Ring-tailed Lemurs (*Lemur catta*)

This SSP species is listed as vulnerable in the wild. There are 470 individuals at 85 institutions.

Seventy percent of the population cannot breed due to unknown pedigree.

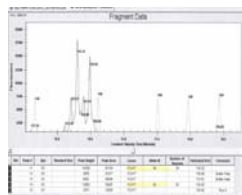
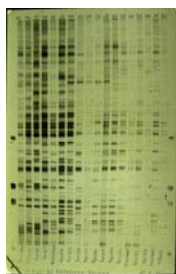
Maternities are in question for some infants as females can take the young of another female. Paternities are in question as females mate with multiple males.



## Approach

### DNA Fingerprint

Measure all of the bands shared between all pairs of individuals  
First-order relatives--a mom and her offspring -- should share about 50% of their bands. The father should share the other 50%.



### Computerized Data

Microsatellites are a useful way of determining paternity by taking a specific gene/trait and computing if the animal is heterozygous or homozygous for that trait.



### Anticipated Outcomes and Benefits

- Individual lemurs and terns will be returned to the breeding population, adding valuable genetic variation to the gene pool
- Inca terns will be elevated to SSP status following our study

### Conclusions

There are implications for all taxa and all zoos once we answer these questions:

- Are molecular methods useful and effective in the real world and how we compensate because of lack of cooperation from zoos, missing samples
- How many generations back can we reconstruct pedigrees
- Is it worth the expense, how can we minimize this cost
- Is there a long-term gain in effective population management
- Can we continue with maintenance and tissue banking
- Can we develop tools to facilitate similar application to other taxa



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